

# **Study on Improvement of Strength of FRP Reinforced by Grafting CNF (Cellulose Nano Fibers) onto the Reinforcements**

## **Project Leader**

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## **1. Objective**

### **This project is aimed at:**

The objective of this project is to improve the strength of FRP by grafting CNF (cellulose nano fibers) onto the reinforcement fibers. CNF is a natural fiber made from plants. Our idea is not to mix CNF with resin, but to graft CNF directly onto the reinforcements. Using this approach, the interfacial strength of FRP can be improved by a low quantity of CNF. Additionally, this approach can solve molding problems by using high-viscos liquid resin mixed with CNF.

## **2. Project Outline**

### **To that end, the project will consist of the following phases:**

- (a) Evaluate the effect of grafting CNF on interfacial strength
- (b) Determine a mechanism to strengthen the fiber/matrix interface
- (c) Improve the fatigue strength of FRP by grafting CNF

## **3. Expected Performance**

### **In this project, the successful candidate would be expected to:**

- (a) Evaluate the interfacial strength between fiber and matrix by grafting CNF on a reinforcement fiber.
- (b) Conduct micro droplet tests and fragmentation tests.
- (c) Determine how to strengthen the interface by using SEM, XRD, etc.
- (d) Manufacture FRP by grafting CNF and conduct fatigue bending tests to evaluate the effect of CNF-treatment on the fatigue strength.

## **4. Required Skills and Knowledge**

### **The successful candidate for this project will have the following knowledge and skills:**

- (a) Fundamental knowledge of composites
- (b) Fundamental knowledge of mechanical simulation, such as FEM (finite element method)
- (c) Fundamental knowledge of observation techniques of materials

## **References**

- 1) F.H. Zhang, et. al., Interfacial shearing strength and reinforcing mechanisms of an epoxy composite reinforced using a carbon nanotube/carbon fiber hybrid, J. Materials Science, 44(13), pp.3574-3577 (2009)
- 2) Y.Z. Shao, et. al., Effect of cellulose nano fiber (CNF) on fatigue performance of carbonfiber fabric composites, Copmotes: part A, 76, pp.244-254 (2015).

## **See our admission guidelines:**

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